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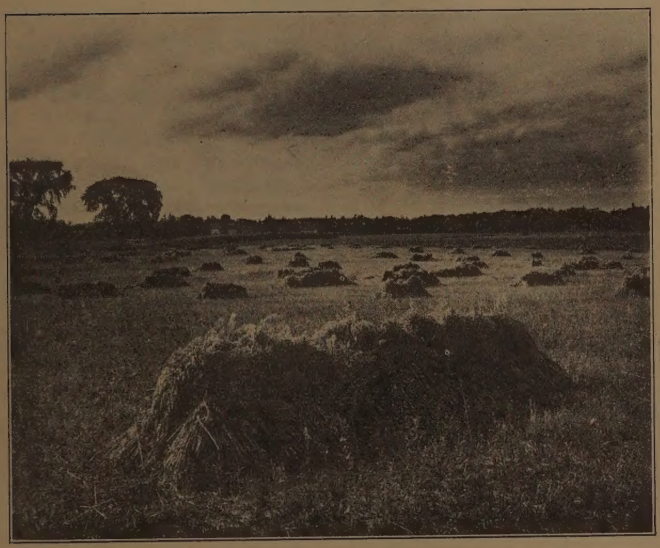
B. R. CHURCHILL



AGRICULTURAL EXPERIMENT STATION
MICHIGAN STATE COLLEGE
Of Agriculture and Applied Science

SECTION OF FARM CROPS

East Lansing, Michigan

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B. R. CHURCHILL

The climatic conditions of the Upper Peninsula of Michigan are well suited to the production of oats. The summer rainfall is fairly evenly distributed[1] and the cool growing season is favorable to good yields. Sections of the Upper Peninsula bordering the Great Lakes have a longer growing season than interior counties, but even in the interior the average length of growing season gives ample time for oat production. The crop is grown on soil types ranging from light sands to very heavy clays,[2] and the acreage of oats is greater than the combined acreage of all other field crops in this territory excluding tame hay. However, even in years of high production the demand for oats as feed in the Upper Peninsula has been greater than the supply and feed oats have been shipped into this section every year. This annual expenditure for feed can be at least partially eliminated by the control of some of the factors which tend to make the production of oats uncertain.

Seed Treatment To Control Smut

Oats in the Upper Peninsula are affected by both covered and loose smut but the latter is far more common than the former. Although the smuts have not caused as much damage to oats as has the stem rust, nevertheless, failure to treat seed sometimes results in serious losses. In one variety of oats on the experimental plots in 1930, the writer found 25 per cent of smutted heads. Early varieties, as a rule, have been more susceptible to smut than medium or late maturing varieties. Fortunately, both smuts can be controlled by careful seed treatment and, to insure oats free from smut, some method of seed treatment should become an established farm practice.

For the past quarter of a century or more, some form of the formaldehyde treatment has been used for controlling oat smut. This treatment has been very satisfactory in its control of the disease, but it has several minor objectionable features. It requires several hours to accomplish its purpose. If the wet method is used, it swells the kernels and the latter must be dried before seeding. If the formaldehyde is too concentrated, there is danger of killing the seed. When the concentrated spray method is used, the task will prove to be irritating to the workers unless special care is taken to carry on the treat-

[1] See Table VII.

[2] This bulletin is essentially a report on varietal yield tests and disease studies of oats at the Upper Peninsula Experiment Station. No attempt has been made by the writer to cover fully the subject of oat growing in the Upper Peninsula.

ment in an open, well ventilated room. These objections have brought about experimentation in an endeavor to find a quicker, easier, and more pleasant method of seed treatment. A large number of chemicals have thus been tried by various experiment stations.

To determine the value of various chemicals for oat smut control under Upper Peninsula conditions, experiments were conducted at the Chatham station in 1929 and in 1930. In 1929, three varieties were used; namely, Anthony, Wolverine, and Markton. Anthony is a medium maturing white oat developed at the Minnesota Station for resistance to stem rust. It is, however, very susceptible to smut. Wolverine, also a medium maturing white oat developed at the Michigan Station, has proved to be very susceptible to stem rust, while only moderately susceptible to smut. Markton, a white oat, somewhat earlier in maturity than either Anthony or Wolverine, proved to be very susceptible to stem rust under Upper Peninsula conditions. Markton was developed at the Oregon Experiment Station and one of its noteworthy characteristics is its resistance to oat smut. In 1929, seed of each of these varieties was treated with ceresan, formaldehyde, and copper carbonate and the crops grown were compared with those from untreated seed of the same varieties. In these experiments, four different rod-row plantings were made of each seed lot. None of the seed was inoculated with smut spores. In 1930, another variety, Iogold, was added; 10 plantings of each treatment were made and another chemical smuttox, was used. Iogold, an early maturing yellow oat was developed for stem rust resistance at the Iowa Station. Five series were inoculated for smut and five were not inoculated. Smut inoculation was accomplished by shaking a small quantity of spores and oat seed together in an envelope before treating. In both years, all treatments were with dust material except in the case of the old formaldehyde treatment. All plots were seeded at the same rate and the resulting stands were uniform.

As shown by Table I, Markton oats showed only two heads of smut in all plots in 1929; one in an untreated plot and the other in a copper carbonate treated plot. In 1930, no smut on Markton was found in any of the plots, even where the seed was inoculated with smut spores. In the varieties Anthony and Wolverine, smut was more prevalent in 1930 than in 1929. In 1930, inoculation with smut spores increased the average number of smutted heads in Wolverine oats from 6.4 to 53 per rod row, while in Anthony oats the increase was from 43 to 67 smutted heads. In the variety Iogold, inoculation failed to increase the number of smutted heads per rod row; however, smut counts were as high in uninoculated plots of this variety as they were in the inoculated plots of the variety Wolverine. In all trials for the two years, formaldehyde gave complete control. It will be noted that in 1929 and in the uninoculated plot of Wolverine oats in 1930 where smut counts were low, copper carbonate apparently gave fair control. However, in 1930, in the case of the Anthony and Iogold varieties with naturally high smut counts and in all smutted plots resulting from inoculation, copper carbonate gave very little control. This is significant inasmuch as in cases of low natural infection the results might be misleading unless treatments on smut inoculated seed were also tried.

The ceresan treatment in 1930 gave practically the same percentage

Table I.—Comparison of materials used to control the smuts of Oats on Different Varieties.

Variety	Treatment	1929 Trials		1930 Trials			
		Seed Not Smut Inoculated		Seed Not Smut Inoculated		Seed Smut Inoculated	
		Average No. Smutted Heads per Rod-Row	Per cent Control [3]	Average No. Smutted Heads per Rod-Row	Per cent Control	Average No. Smutted Heads per Rod-Row	Per cent Control
Wolverine	Untreated	1.50		6.40		53.00	
Wolverine	Formaldehyde	.00	100.0	.00	100.0	.00	100.0
Wolverine	Ceresan	.25	83.5	0.20	97.0	.20	99.5
Wolverine	Copper Carbonate	.50	66.5	0.60	90.5	44.00	17.0
Wolverine	Smuttox			0.20	97.0	.20	99.5
Anthony	Untreated	28.00		43.20		67.40	
Anthony	Formaldehyde	.00	100.0	.00	100.0	.00	100.0
Anthony	Ceresan	9.50	66.0	5.20	88.0	8.60	87.0
Anthony	Copper Carbonate	7.50	73.0	31.00	28.0	53.80	20.0
Anthony	Smuttox			.00	100.0	.20	99.5
Markton	Untreated	.25		.00		.00	
Markton	Formaldehyde	.00	100.0	.00		.00	
Markton	Ceresan	.00	100.0	.00		.00	
Markton	Copper Carbonate	.25	.0	.00		.00	
Markton	Smuttox			.00		.00	
Iogold	Untreated			53.80		48.00	
Iogold	Formaldehyde			.00	100.0	.00	100.0
Iogold	Ceresan			3.40	93.5	5.80	88.0
Iogold	Copper Carbonate			36.20	32.5	32.00	33.5
Iogold	Smuttox			.00	100.0	.20	99.5

[3] Per cent control represents the percentage difference between the number of smutted heads found in the rod-rows planted with untreated seed and the number found in plots planted with treated seed.

of control in the uninoculated plots as it did in the inoculated ones. With one exception, ceresan gave a high percentage of control, but, in no case, was the control with this treatment complete.

Smuttox, a formaldehyde dust material, was not tried in 1929, but, in 1930, in the cases of both inoculated and uninoculated seed, the treatment was very efficient in controlling smut, never falling below 97 per cent control.

Table II.—Yield of oats in 1930 seed treatment trials.

	Wolverine	Anthony	Markton	Iogold
	Yield Bushels per Acre	Yield Bushels per Acre	Yield Bushels per Acre	Yield Bushels per Acre
Untreated	29±1.14	31±1.22	31±1.22	42±1.65
Formaldehyde	27±1.06	32±1.26	24±0.95	40±1.58
Ceresan	32±1.26	39±1.54	33±1.30	45±1.77
Copper Carbonate	26±1.02	34±1.34	34±1.34	43±1.69
Smuttox	30±1.18	39±1.54	30±1.18	44±1.73

The effect of the treatments upon the yields of the four varieties for 1930 is shown in Table II. Where Wolverine oats were sown, none of the treatments influenced the yield appreciably as compared with the untreated plots. With the Anthony variety, both ceresan and smut-

tox increased the yield over the untreated plots. The formaldehyde treatment decreased the yield of the smut resistant Markton oats as compared with untreated plots of this variety, while none of the other treatments gave any significant difference in yield. Formaldehyde may have caused some injury to the varieties Wolverine, Anthony, and Iogold but the injury was not apparent, perhaps because it was counterbalanced by the beneficial results of controlling the smut. With Iogold oats none of the treated plots differed widely in yield from those untreated. In the untreated plots the yields of Wolverine, Anthony, and Markton oats were practically the same. Untreated plots of Iogold oats out-yielded the untreated plots of the other varieties by more than ten bushels per acre.

Stem Rust

Stem rust of oats can be found in the Upper Peninsula every year. Observations indicate that it seriously damages the crop once in every

Fig. 1.—Rust Nursery, Upper Peninsula Experiment Station, 1930.

three or four years. In 1925 and 1928 when rust was not severe, the average yields of oats for the Upper Peninsula were 2.7 and 4.0 bushels per acre higher than the State average. However, in 1926 and 1927 rust did great damage to the Upper Peninsula oat crop, the yields being 7.8 and 5.1 bushels per acre lower than the State average. In 1926 at the Upper Peninsula Experiment Station, a forty-acre field of Wolverine oats which early in August gave promise of a yield of at least 75 bushels per acre was practically destroyed by rust, the actual yield being 19 bushels per acre and the weight being 25 pounds per bushel. The development of resistant varieties is at the present time the most promising method of combating this disease. A number of varieties have been grown in a rust nursery at the Upper Peninsula Experiment Station[4] that show considerable rust resistance.

It will be noted in Table III that group I, which showed the great-

[4]1924-1930 in co-operation with the United States Department of Agriculture.

est resistance to stem rust, consists largely of varieties of Kherson and White Tartar types. Among the Kherson type varieties are Richland, Iogold, and Edkin. At Chatham, these varieties have proved to be from one to three weeks earlier than the varieties of the White Tartar type, such as White Tartar, Anthony, and the Minota x White Russian cross. All varieties of Group I have been only slightly damaged by stem rust even in years when rust was severe.

Table III.—Oats stem rust co-efficient[5] 1924-1930.

Variety	1924	1925	1926	1927	1928	1929	1930	Ave.	Group[6]
Richland	trace	1	3	0	trace	2	1	1	I
Hajira Rustproof	trace	trace	2	40	trace	trace	trace	6	I
White Tartar	trace	2	1	6	trace	2	2	2	I
Green Mountain	.....	2	2	20	trace	2	4	5	I
Anthony	.....	2	3	4	trace	1	8	3	I
Minota x White Russian	.....	3	2	4	trace	2	2	2	I
Iogold	.....	.....	trace	trace	0	1	trace	trace	I
Edkin	.....	.....	.....	trace	1	2	1	1	I
Iowa 444	.....	.....	2	4	trace	trace	.....	2	I
Iowar	15	25	35	10	5	75	23	27	II
Burt	35	20	20	50	5	76	.....	34	II
Fulghum	45	32	23	25	9	76	.....	35	II
Kanota	.....	.....	45	25	8	76	.....	39	II
Rustless	18	14	21	15	1	45	.....	19	II
Ruakura	63	36	45	8	7	58	50	38	II
Joanette	7	11	49	32	3	9	27	20	II
Gopher	.....	.....	40	40	8	75	.....	41	III
Silvermine	85	30	95	75	14	45	45	56	III
Iogren	75	25	85	50	5	45	.....	48	III
Red Rustproof	50	15	75	75	45	35	30	46	III
Markton	.....	.....	45	75	14	80	45	52	III
Swedish Select	45	40	65	75	5	30	.....	43	III
Wolverine	.....	41	68	68	27	68	27	50	III

(5) The number of rust pustules present was estimated in terms of percentage, assuming that the maximum number that could be present when stems were completely covered would be 100 per cent. Graduations of the size of the pustules were made from very small pustules to very large pustules. The value 1.0 was given to the very large pustules, while the value 0.1 was given to the very small pustules and intermediate sizes fell between these two values . The rust co-efficient is the product of the percentage of rust present and the value which indicated the average size of the pustules. Varieties were grown in rod rows and rust co-efficients determined for each variety. It will be noted here that the lower the rust co-efficient, the more resistant the variety is; while the higher the rust coefficient, the more susceptible the variety is.

(6) Group classifications were made on the basis of rust susceptibility and resistance as follows: 0-15=Group I, very resistant; 16-40=Group II, fairly susceptible, and 41-up=Group III, very susceptible. The figures indicate the rust coefficient as found in the column marked average.

Group II shows a marked difference in rust resistance to Group I, being much more susceptible. It is composed largely of red oats.

Varieties of Group III have been classified as very susceptible. The yield of these varieties is influenced greatly by rust and when the disease is severe the oat yield may be reduced 50 per cent or more. From Table III, it will be noted that varieties in this group show a high rust coefficient in all years except 1928. Rust was most serious in 1924, 1926, 1927, and 1929. Varieties of this group as a whole are medium in maturity. Wolverine and Swedish Select types, both in Group III, make up more than 75 per cent of all the oats grown in the Upper Peninsula.

Other Methods of Reducing Rust Losses

Throughout the Upper Peninsula, stem rust may be found on oats in the early part of the season, however, severe epidemics usually occur after the oats have fully headed out. It follows that early planting of oats may sometimes enable the crop to escape the rust. In 1930, four dates of planting were made of Iogold, an early maturing, very rust

resistant variety, and Wolverine, a medium maturing, very rust susceptible variety. Table IV shows the yields of these plots together with their weight per bushel.

Yields of both varieties decreased as the date of planting was retarded but the yield of Wolverine oats, susceptible to rust, decreased much faster than the yield of the rust resistant Iogold oats. Wolverine oats maintained a test weight two pounds per bushel heavier than that of Iogold oats throughout all dates of planting. However, the weight per bushel of both varieties decreased as the date of planting was retarded.

Table IV.—Effects of date of planting on yields of Wolverine and Iogold oats in 1930.

Variety	Date of Planting	Bushels per Acre	Weight per Bushel in Pounds	Per cent Yield Decrease
Iogold	May 6	48.0±3.09	33.0	
Wolverine	May 6	49.0±3.15	35.5	
Iogold	May 12	46.5±2.99	31.0	3.1
Wolverine	May 12	38.0±2.44	33.5	22.4
Iogold	May 20	41.5±2.67	29.5	13.5
Wolverine	May 20	30.0±1.93	31.5	38.8
Iogold	May 27	34.0±2.19	28.5	29.2
Wolverine	May 27	20.5±1.32	30.5	58.2

It is evident from Table IV that stem rust played an important part in reducing the yield of Wolverine oats in the second, third, and fourth dates of planting. It follows that anything which will hasten the maturity of the crop will reduce the losses caused by the rust. Though it is essential that oats be seeded on a clean, firm seed bed, it is likewise essential that seedings be made as early as possible in order to escape the rust. In a region where late springs are common, it is almost impossible to seed early on a well prepared seed bed unless the ground is fall plowed. In other sections, oats often follow a cultivated crop in the rotation; however, in the Upper Peninsula, the acreage of cultivated crops is limited since many sections of the Peninsula cannot mature corn. Thus of necessity oats are frequently seeded on sod break. This is sometimes cut-over land. It is almost impossible to spring plow a sod and properly fit the seed bed for early planting of oats. Fall plowing gives the sod a chance thoroughly to decompose and a good seed bed can be prepared in the spring in a relatively short time.

Fertilizers can sometimes be used to advantage in hastening the maturity of the oat crop. Complete commercial fertilizers are not always economical for use directly on the oat crop since the latter is often of rather low acre value. Where the rotation will permit, such fertilizers will give greater returns if applied to potatoes or legume hay. At the Upper Peninsula Experiment Station, the application of 150 to 200 pounds of superphosphate per acre at seeding time has hastened the maturity of the oat crop from seven to ten days. Superphosphate helps to give the plants a good start, fills out the kernels, and hastens the maturity of the crop materially. This last factor may enable the oats to escape the most severe rust infection.

Variety Yield Experiments

Quality of seed, stiffness of straw, handling qualities, disease resistance, ability to yield, and a number of other characteristics all go to make an oat variety desirable. Of course, the ability to yield well is the most important characteristic but in several instances that is the direct result of the other characteristics mentioned. The most satisfactory way to determine the yield of a given variety is by a comparative test of that variety with others of known merit when all are grown under uniform conditions.

During the last 12 years, a large number of varieties have been compared for yield at the Upper Peninsula Experiment Station. In most instances, the plots have been one-fortieth (1/40) acre in size, being

Fig. 2.—From 1926 to 1930 this machine was used to thresh the plots. Special slides were cut in the machine to facilitate cleaning. A thorough clean-out was made only between varieties. Grain flowed from the grain spouts by shaking and gravity and not by a grain screw. Both grain spouts were removable for cleaning. All grain screens were removed for each cleaning. In years previous to 1926, a larger machine was used with an air pressure cleaning device.

one-half drill width wide. All varieties were seeded at the rate of two and one-half bushels per acre. The land on which the plots were grown has been in a regular rotation in which potatoes preceded the oat plots. The land was fall plowed and seedings were made as soon as the ground could be prepared in the spring. Wolverine oats were planted every fourth plot as a check on possible variations in soil fertility and such variations have been considered in interpreting the results of these comparisons.

Results[7]

As shown in Table V, the average yields of the varieties Wolverine, Minota No. 512, and Wisconsin No. 77 were practically the same for

Table V.—Yields of oat varieties 1919-1929[6].

Variety	Yield in Bushels per Acre										
	1919	1920	1921	1922	1923	1924	1925	1927	1928	1929	Average
Wolverine	75	130	42	35	22	71	60	31	46	73	59±1.16
Minota No. 512	90	127	42	25	25	79	56	41	59	69	61±1.20
Wisconsin No. 77	78	86	54	33	25	74	64	61	60	61	60±1.18
Wolverine	75	130	42	35	22	71					63±1.63
Worthy	70	128	41	28	21	87					63±1.63
College Wonder	71	127	39	41	24	75					63±1.63
Sixty-day	90	88	51	19	24	69					57±1.48
Iowa No. 103	93	96	56	37	36	60					63±1.63
Silvermine	64	105	39	27	26	83					57±1.48
Wisconsin No. 5	69	106	35	32	21	74					56±1.45
Swedish Select		125	39	20	21	73					56±1.66
Wolverine	75	130	42								82±2.49
College Success	71	131	35								79±2.39
Alexandria	59	123	43								75±2.27
Improved Ligowa	74	129	37								80±2.42
Early Gotland	71	123	37								77±2.33
Wisconsin No. 132	72	106	37								72±2.17
Wisconsin No. 1289	59	78	32								56±1.69
Wisconsin 14	49	103	29								60±1.81
Wolverine				35	22	71					43±2.11
Banner				23	19	81					41±2.01
White Bananza				26	18	61					35±1.72
Swedish Crown				19	34	70					41±2.01
Alberta				21	16	73					37±1.82
Wisconsin No. 1				28	18	81					42±2.06
Wisconsin No. 7				39	31	66					45±2.21
North Dakota Sixty-day				29	32	63					41±2.01
Sixty-day No. 674				40	34	77					50±2.46
Lincoln				35	23	73					44±2.16

(7) Variety experiments for the years 1919, 1920, 1921, 1924 and 1925 were conducted by G. W. Putman. Experiments for the years 1922 and 1923 were conducted by H. R. Pettigrove. Experiments for the years 1926, 1927, 1928, 1929 and 1930 were conducted by the writer.

(8) Plots were not harvested in 1926 because of very severe rust infection and very unfavorable weather conditions at harvesting time.

the ten-year period. All varieties tried during the six-year period, 1919 to 1924, were practically equal in yield. Over the three-year period, 1919 to 1921, no variety which was tried consistantly out-yielded Woverine oats. For the three-year period, 1922 to 1924, the variety Sixty-day No. 674 yielded more than the variety Wolverine in each of the years 1922, 1923, and 1924 and averaged seven bushels per acre more for the three-year period. This seems to be an appreciable increase; however, too much confidence should not be placed on an average difference of seven bushels per acre under these circumstances because only one plot of each variety was grown each year and the experimental error was high.

Table VI gives the yields of varieties for the years 1925 to 1930 with the exception of one year. In 1926, the plots were not harvested. Severe rust damage, insect damage, and excessive wet weather caused a crop failure. Storms at harvesting time broke off many of the heads of the plants. With only a few exceptions the varieties shown in Table VI are varieties that have made good in the locality for which

Table VI.—Yields of oat varieties 1925-1930.

Variety	Yields in Bushels per Acre					
	1925	1927	1928	1929	1930	Average
Wolverine	60	31	46	73	49	52±1.43
Czar of Russia	55	32	54	70	47	52±1.43
Golden Rain	61	37	56	61	50	53±1.46
Iowar	63	43	55	65	56	56±1.54
Cornellian	44	29	46	.....	.....	40±1.56
Victory	52	34	53	66	49	51±1.40
Alberta	42	34	48	62	.....	47±1.37
Pickett	59	35	53	66	44	51±1.40
College Wonder Sel. No. 1	62	31	59	62	47	52±1.43
Swedish Crown	68	33	52	68	42	53±1.46
Empire	47	36	50	72	49	51±1.40
College Wonder Sel. No. 2	55	33	53	68	48	51±1.40
Minn. No. 687	.....	44	61	77	49	58±1.77
Minn. No. 688	.....	40	51	64	51	52±1.59
Minn. No. 689	.....	46	47	71	44	52±1.59
Richland	.....	.....	71	61	53	62±1.98
White Tartar	.....	.....	56	55	41	51±1.63
Iogold	.....	.....	.....	62	48	55±2.11

they were developed. They range in maturity from the extremely early varieties, Richland and Iogold, to the extremely late variety, White Tartar. Varieties of both white and yellow types were included. Where varieties have been tried for the same number of years, their average yields are practically the same, ranging from 52 to 56 bushels per acre. Richland oats averaged 62 bushels per acre for the years it was tried, while Wolverine oats averaged 56 bushels per acre for the same years.

Harvesting conditions in the fall are other factors that greatly in-

Fig. 3.—Oat Plots at the Upper Peninsula Experiment Station, 1930

Plots are separated from each other by an alleyway eighteen inches wide. These plots are cut with a tractor and six-foot binder. The binder is cleaned between plots. Each plot is placed in a shock and the latter covered with a canvas to protect it from rains and birds.

fluence the type of oats grown. The time of harvesting for medium maturing varieties, such as Wolverine, ranges from August 14 to 21 in some sections of the Upper Peninsula to September 1 to 7 in other sections. Rainfall is the prime factor in determining harvesting conditions for oats. Its potential influence in any month may be observed by a study of Table VII.

Table VII.—Rainfall during the growing season at Chatham, 1919-1930[9].

Month	Rainfall in Inches												
	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	Average
May	2.77	.....	3.20	3.17	0.46	4.32	1.18	0.93	5.50	1.60	4.31	3.93	2.85
June	2.43	0.82	2.95	1.98	3.57	2.03	3.97	4.54	1.99	6.39	2.51	5.12	3.19
July	0.93	1.12	1.25	5.26	5.86	3.24	1.51	2.76	6.48	1.58	3.29	1.38	2.89
August	2.71	1.61	.....	1.23	2.75	6.49	2.05	2.25	0.31	3.36	2.97	1.70	2.49
September	3.35	4.09	.....	3.15	2.33	3.04	3.13	7.85	2.72	6.36	3.38	2.43	3.80
Total	12.29	.....	.....	14.79	14.97	19.12	11.84	18.33	17.00	19.30	16.46	14.56	15.22
Average	2.46	.....	.....	2.98	2.99	3.82	2.37	3.67	3.40	3.86	3.29	2.91	3.04

(9) Records given herewith were taken at the Upper Peninsula Experiment Station. Although there are localities showing less rainfall, there are also sections with more rainfall and conditions at Chatham are believed to be representative for the entire Peninsula.

Rainfall in the Upper Peninsula is highest in September and lowest in August. Although Table VII does not give the distribution of rainfall within a particular month, it is nevertheless true that considerably more than half of the rainfall in August comes during the last half of that month. These conditions make the problem of harvesting and threshing oats a very important one. In several of the years between 1919 and 1930, a large acreage of oats could not be harvested and some that were harvested could not be saved because of prevailing wet weather. The moisture content of the grain in several instances was too high for safe storage. Perhaps for this reason more than any other, the early maturing oats are to be preferred. The very early varieties at Chatham are ready for harvest about August 15. This is fully two weeks before Wolverine, a medium maturing oat could be harvested.

Summary

1. Varieties showed resistance to oat smut in the following order: Markton, Wolverine, Iogold, and Anthony. Markton was practically immune, while Anthony was very susceptible.

2. The effectiveness of seed treatment with formaldehyde, smuttox, ceresan, and copper carbonate in the control of smut was in the order named. Formaldehyde and smuttox gave excellent control; ceresan gave fair control, while copper carbonate gave very little control, especially where the seed was smut inoculated.

3. Inoculation with smut spores increased the percentage of smut in Wolverine oats and Anthony oats.

4. The seed treatments used had no apparent effect upon the yields

of the varieties Wolverine and Iogold. Formaldehyde decreased the yield of Markton oats, while smuttox and ceresan increased the yield of Anthony oats.

5. Stem rust has seriously damaged the oat crop once in every three or four years at Chatham.

6. Over a period of years both Richland and Iogold oats proved to be very resistant to stem rust. Both are early in maturity.

7. The varieties Silvermine, Markton, Wolverine, and Swedish Select proved to be very susceptible to stem rust.

8. Late planting of both Iogold and Wolverine oats in 1930 reduced both the yield and the weight per bushel. Yield was maintained over a longer range of date of planting in Iogold oats than it was in the variety Wolverine.

9. From 1919 to 1930, no variety was tested that consistently outyielded Wolverine. Several proved equal to Wolverine.

10. Year in and year out, early maturing oats were more dependable than medium maturing oats.

11. Harvesting conditions favor the early type oats.

Recommendations

1. Seed oats should be treated to control smut.

2. Oats should be seeded as early as possible on well prepared firm seed beds for best yields.

3. In sections of the Upper Peninsula where stem rust or unfavorable fall weather conditions are common, it is advisable to grow an early rust resistant oat variety such as the Iogold or Richland.